



United States Department of the Interior

GEOLOGICAL SURVEY



ASTROGEOLOGY SCIENCE CENTER
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FLAGSTAFF, AZ 86001

January 25, 2016

TO: Planetary Science Division, Science Mission Directorate, NASA
FROM: USGS Astrogeology Science Center
RE: Synergy within the Planetary Data Services

Solicitation Number NNH15ZDA012L states that a community-based roadmap for NASA's Planetary Data Services covering 2017-2026 is being developed. The Planetary Data Services is not to be confused with the Planetary Data System. To distinguish these I will refer to these entities as "PD Services" and "PDS." The PDS is one of four organizations that will make up the PD Services. One of the other organizations is "the joint NASA-U.S. Geological Survey Astrogeology Science Center."

Before beginning, I am compelled to address the phrase "joint NASA-U.S. Geological Survey Astrogeology Science Center." The Astrogeology Science Center is a USGS entity that is funded largely through peer-reviewed proposals to NASA. Other USGS science centers also do work for NASA, including the Planetary Science Division. The Astrogeology Science Center does work for many organizations other than NASA. There are two true joint NASA-USGS efforts within the Astrogeology Science Center. The first is the PDS Cartography and Imaging Sciences Node. The other is the Planetary Geologic Mapping Program, which is an important but small part of what has historically been called the NASA Planetary Cartography Program (or "Carto" for short). It is worth noting that the PDS and Carto efforts, together, have typically constituted less than a third of the work of the Astrogeology Science Center.

The situation described above creates a complex network of relationships between NASA, the USGS, the PD Services, Carto, and the PDS. This provides many opportunities for synergy, innovation, and success. The objective of this letter is to highlight ideas to bring this about.

We applaud the concept of the PD Services as an umbrella over PDS and other programmatic efforts to emphasize the value of planetary data and products. Having these activities under one roof should strongly encourage providing the science community these essential services under a single "brand," supporting a more coherent and organized approach and allowing science to proceed more efficiently and effectively.

We support having Carto underneath the PD Services umbrella as long as the different roles are clearly articulated. The goal of Carto is to produce higher-level, readily usable products from lower level data placed in the PDS. The Carto products should allow the fusion of disparate data by adding accurate geospatial information and assuring the information is in a consistent form with quantified uncertainties. A secondary goal of Carto is to share the tools to create these products so missions and individual researchers can

produce their own custom products on demand. The role of PDS is to archive lower- and higher-level data products and make them accessible to the science community. These are two very complementary but distinct roles.

The peer-review process for higher-level products must be established. While higher-level products from a wide variety of providers are important to PDS and to data users, it is essential that they be reviewed rigorously for adherence to known cartographic standards. The PDS review process prior to accepting high-level products needs to be adapted to include rigorous review of higher-level products by Astrogeology and/or other cartographic experts. This process should include consultation with experts from the International Astronomical Union. One way to ensure that the products meet PDS standards is to have the product developers use tools that are certified to use IAU and PDS cartographic standards. All Carto tools should have this certification (e.g., the ISIS software system).

Cartographic methods and standards should be incorporated early in every NASA mission. Cartographic data acquisition methods are essential for making the most cost effective and usable cartographic products with data from any mission. When the data are planned and acquired properly throughout a mission, products are straightforward to produce, relatively inexpensive, and provide support for science and exploration goals by ensuring that the most accurate product possible has been developed. This can be accomplished by funding the early involvement of Astrogeology personnel or other cartographic experts in any NASA mission that will need to deliver spatially aware products.

We encourage NASA PSD to require that ancillary data needed to produce higher-level products be archived in a standardized format. Although much progress has been made by the PDS in reviewing and requiring documentation on all processing and calibration steps, not all aspects of mission data are available in usable form from PDS. For example, optical distortion parameters are often not provided by camera teams, and that which is provided is often in non-standard and poorly documented formats, making them virtually unusable. An effort would need to be made to select an appropriate standard for each type of data (e.g., the Community Sensor Model for distortion models). Similar standards are needed for radiometric calibration data and methods.

Compatibility between tools and products under the PD Services umbrella should be enforced. For example, tools produced under Carto should work with all PDS data. The same tools should be able to work with geospatial data from the Minor Planets and Astromaterials Research And Exploration Science Centers (e.g., geospatially locate lunar samples). Search tools should be able to find data in the PDS, Minor Planets Center, and Astromaterials.

We encourage a strong emphasis on making tools and services user friendly. This goes far beyond clean user interfaces on applications. All data and tools should use the same internationally recognized standards and a common set of terminology for key concepts. Confusing duplication of services should be avoided. New tools, for example an online tool to assist missions prepare their data for PDS submission and approval, need to be developed. There must be a strong component of user training, both face-to-face and online.

Finally, we respectfully request that every effort be made to coordinate the PD Services road map efforts with the FY16 report on the community needs for planetary cartography being assembled by MAPSIT.

Sincerely,

A handwritten signature in black ink that reads "Laszlo Kestay". The script is fluid and cursive, with the first letters of each name being capitalized and prominent.

Laszlo Kestay
Science Center Director
USGS Astrogeology Science Center
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